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Earnings Dilution and the Explanatory Power of Earnings for Returns

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ABSTRACT: Executive stock options and convertible securities can increase the number of common shares outstanding while adding less than the market value of the newly issued securities to a firm's assets. We model the effect of expected dilution on the earnings/return relation. Expected dilution effectively reduces the permanence of an earnings innovation. Empirical evidence supports the hypothesis that dilutive securities attenuate the relation between earnings and returns. Estimated earnings response coefficients (ERCs) are significantly lower when there are shares reserved for conversion. The effect is more pronounced for firms that have experienced price increases or positive earnings news, as these increase the expected dilutive effect of conversions.

Keywords: *stock options; dilution; earnings; stock returns.*

I. INTRODUCTION

We examine whether the association between stock returns and earnings reflects the potential diluting effect of securities such as executive stock options, stock rights, convertible preferred shares, and convertible bonds. The increased use of these dilutive securities—in particular, of executive stock options—has attracted the attention of the business press, regulators, and academics. In May 1998, for example, the *Forbes* magazine cover stated "Stock Options are Diluting Future Earnings." The related story (Morgenson 1998) detailed firms' increasing use of options as a form of executive compensation, stated that option plans represent a mortgage on future earnings, and implied

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that investors are largely unaware of the cost associated with options plans. This last concern exists despite the fact that accountants have tried to incorporate the effect of dilutive securities into accounting numbers since 1969, when the Accounting Principles Board passed APB No. 15 (AICPA 1969).

We explore how current shareholders incorporate unexpected earnings into share price when the firm has outstanding dilutive securities. We extend Ohlson (1995) and show analytically that investors should place lower value on unexpected earnings when they anticipate dilution. We then investigate the relation among earnings changes, returns, and dilutive securities in an association study framework. We find that expected dilution significantly weakens the relation between contemporaneous earnings changes and returns. This result holds whether we define earnings changes as changes in total earnings, changes in primary earnings per share (EPS), or changes in fully diluted EPS. We also find that shareholders perceive expected dilution to be more costly for firms with rising stock prices and increasing earnings, because these conditions make the exercise of dilutive securities more attractive to their holders. These results suggest that, contrary to the opinions of the business press, investors do not ignore the costs of option issuance. However, our findings indicate that existing GAAP-based measures of diluted EPS are not conservative enough to capture the full effect of dilutive securities.

Recent academic literature has expressed concern over accounting measures of dilution—in particular, the use of the treasury stock method to incorporate the dilutive effect of options in the EPS calculation. APB No. 15 first mandated the treasury stock method in 1969; although Statement of Financial Accounting Standards (SFAS) No. 128 (FASB 1997) supersedes APB No. 15, it continues to use this method.[1] The treasury stock method assumes that the firm uses the hypothetical receipt of the exercise price from option holders to purchase shares on the open market at the average market price for the year. Accounting dilution occurs when the exercise price is less than the average market price. In this case, the shares deemed purchased are insufficient to satisfy all of the options, and the difference is made up through the issue of hypothetical new shares that are added to the denominator of the diluted EPS calculation.

Scott and Wier (2000) examine the effect of treasury stock-based dilution adjustments on the properties of primary EPS. They point out that the treasury stock method of incorporating dilution into the EPS number results in a mechanical, positive relation between the change in the number of shares added to the denominator of EPS and current stock returns. This positive association between changes in dilution and stock returns does not mean that investors like increases in dilution. Rather, as Scott and Wier (2000) point out, it results from the use of the price-based treasury stock method in the presence of accounting conservatism.[2]

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[1] SFAS No. 128 modifies APB No. 15 in several respects, the most major change being the shift from the calculation of primary EPS, which incorporated "expected" dilution, to the calculation of basic EPS, which does not incorporate dilution into the EPS calculation. The incorporation of maximum potential accounting dilution in diluted EPS remains largely unchanged relative to the calculation of fully diluted EPS mandated in APB No. 15.

[2] Under certain simplifying assumptions, Scott and Wier's (2000) change in the dilutive adjustment simplifies to $(\Delta N_t^*/N_{t-1}^*) \times$ (primary EPS_t), where ΔN_t^* is the change in the number of shares entering the denominator of primary EPS under the treasury stock method, and N_{t-1}^* equals the number of shares in the denominator of last period's primary EPS. ΔN_t^* increases in the change in the market price of the firm's common stock and in the number of dilutive shares outstanding. Scott and Wier (2000) provide empirical evidence that the positive relation between ΔN_t^* and share price changes leads to a positive relation between the annual *change* in the firm's dilutive adjustment and contemporaneous stock returns.

Scott and Wier (2000) also report that the correlation between earnings changes and returns is higher when they make no dilutive adjustment to earnings. Combining this evidence with their observed positive association between returns and the *change* in the dilutive adjustment, Scott and Wier (2000) conclude that the treasury stock method may be too conservative. This conclusion is premature for the following reasons. First, because treasury stock-adjusted earnings changes have a component that is proportional to unadjusted earnings changes plus a component that is inversely correlated with current returns (the change in the dilutive adjustment), it is not surprising that adjusted earnings changes have a lower correlation with current returns than do unadjusted earnings changes. Second, all of the treasury shares that the treasury stock method adds to the denominator of the EPS calculation are dilutive. Clearly, shareholders should care about *total* expected dilution, not just about the most recent *increment* to dilution, which is Scott and Wier's (2000) focus. Thus, the Scott and Wier (2000) results cannot address whether the total *level* of dilutive adjustment is too large or too small. Our current, more comprehensive analysis focuses on the expected level of dilution and is not affected by the mechanical relation between increments to the dilutive adjustment and returns that underlies Scott and Wier's (2000) result. Focusing on the levels demonstrates that shareholders view prospective dilution as costly, and our evidence suggests the treasury stock method may not be conservative enough.

Core et al. (2000) also suggest that the treasury stock method understates dilution because it considers only the degree to which options are currently in the money. They propose instead the use of option-pricing methods to calculate the denominator of the diluted EPS number. This increases the denominator of diluted EPS by the difference between the number of shares calculated using the option methods vs. those figured by the treasury stock method. Core et al. (2000) call this difference the "error in incremental shares." They use a relatively small sample (1,787 firm-years) over a short and recent time period, which gives them the detailed data to estimate Black-Scholes option values, and demonstrate that the market views these additional shares as dilutive. Thus Core et al. (2000) corroborate our inferences.

Our work differs from that of both Scott and Wier (2000) and Core et al. (2000) in that, rather than assessing the adequacy of the treasury stock method of dilution, we focus on how the market assesses dilution. Our results complement these other studies and make the following contributions to our understanding of the relations among earnings, valuation, and dilutive securities: First, we extend Ohlson's (1995) model and demonstrate analytically that rational investors should place less value on unexpected earnings when they anticipate dilution. Consistent with this hypothesis, our empirical tests show that the earnings response coefficient is a decreasing function of expected dilution, even when we measure earnings using existing accounting measures of diluted EPS. Second, we focus on the overall *level* of expected dilution, which provides a more comprehensive analysis than does Scott and Wier's (2000) focus on *changes* in measured accounting dilution. Third, there is no direct mathematical relation between our dependent variable (returns) and our dilution measure. Fourth, we use a large sample (63,656 firm-years) and an extensive set of control variables, so our results are more generalizable to the population of firms with outstanding dilutive securities. Finally, our results hold over regimes mandating different disclosure requirements for dilutive securities, thus providing evidence that the market attempted to assess dilution before today's more detailed accounting disclosures.

Our work also extends the earnings response coefficient (ERC) literature by documenting that dilutive securities significantly attenuate the relation between returns and earnings changes. This result is robust to the inclusion of control variables traditionally employed in the ERC literature, such as measures of size, risk, and growth (Collins and Kothari

1989), the absolute magnitude of unexpected earnings (Freeman and Tse 1992), and whether earnings are positive or negative (Hayn 1995).

Our results have implications both for future research and for the evolution of accounting standards. Our analysis indicates that dilutive securities attenuate the ERC even after we use diluted EPS in our regressions. This attenuation implies that SFAS No. 128 understates the total level of expected dilution, and that investors use additional information over that provided by GAAP-based EPS measures when valuing their share of future earnings. Consequently, both researchers and standard setters might consider alternative disclosures on dilutive securities to provide investors with more information to estimate their share of future cash flows.

The paper proceeds as follows. Section II presents both our model and hypotheses that explain the effect of expected dilution on the earnings/return relation. Section III describes the sample and research design, and Section IV presents our empirical results. Section V concludes the paper and discusses the implications of our results for financial reporting on dilutive securities.

II. HYPOTHESES DEVELOPMENT

Dilutive securities reduce the magnitude of abnormal stock returns associated with a given amount of unexpected earnings, because they reduce investors' expectations of their share of future firm cash flows. We explore how current shareholders incorporate unexpected earnings into share price when the firm has issued dilutive securities. We examine the effect of dilutive securities on the earnings/return relation in the Ohlson (1995) clean-surplus framework.[3] Following Ohlson (1995), we write the current share price as:

$$P_t = y_t + \sum_{\tau=1}^{\infty} \rho^{-\tau} E_t[\tilde{x}^a_{t+\tau}], \tag{1}$$

where:

P_t = market value or price per share of the firm's equity at date t;
y_t = the net book value per share at date t;
ρ = the required rate of return plus 1;
$E_t[\cdot]$ = the expected value operator conditioned on date t information;
x_t = earnings per share for the period (t − 1,t); and
$x^a_t = x_t - (\rho - 1)y_{t-1}$ = abnormal earnings.

Ohlson (1995) makes the following assumptions about the time-series behavior of abnormal earnings and other price-relevant information.

$$\tilde{x}^a_{t+1} = \omega x^a_t + \nu_t + \tilde{\varepsilon}_{1t+1} \tag{2}$$

$$\tilde{\nu}_{t+1} = \gamma \nu_t + \tilde{\varepsilon}_{2t+1} \tag{3}$$

[3] Modeling the ERCs of firms with and without dilutive securities in an option-pricing framework yields predictions identical to those obtained in the Ohlson (1995) framework. We present these results in the Appendix. We are grateful to Joseph Cherian for helpful discussions that assisted in the preparation of this appendix.

where:

ν_t = information other than abnormal earnings;
$\tilde{\varepsilon}_{1t+1}$ = unexpected abnormal earnings;
$\tilde{\varepsilon}_{2t+1}$ = unexpected non-earnings news;
ω = persistence parameter for unexpected earnings ($0 \leq \omega \leq 1$); and
γ = persistence parameter for non-earnings information ($0 \leq \gamma \leq 1$).

Adopting Ohlson's (1995) assumptions concerning the time-series behavior of abnormal earnings and other price-relevant information allows us to write unexpected returns as:

$$UR_t = \left(1 + \frac{\omega}{\rho - \omega}\right)\frac{\varepsilon_{1t}}{P_{t-1}} + \left(\frac{\rho}{(\rho - \omega)(\rho - \gamma)}\right)\frac{\varepsilon_{2t}}{P_{t-1}}, \tag{4}$$

where $1 + (\omega/(\rho - \omega))$ is the ERC. The ERC is increasing in the persistence of the earnings shock (ω) and decreasing in the required rate of return (ρ).[4] The ERC takes this form because the current earnings shock causes revisions in expectations of future earnings, and shareholders are discounting the stream $\{\omega^\tau \varepsilon_{1t}\}$ from ($\tau = 1,\infty$).

Since ε_{1t} is the unexpected abnormal EPS at time t, we can write it as the ratio of total unexpected abnormal earnings, UE_t, and the number of shares outstanding, N_t: $\varepsilon_{1t} = UE_t/N_t$. Discounting the stream $\{\omega^\tau \varepsilon_{1t}\}$ from ($\tau = 1,\infty$) is correct if the number of shares is expected to remain constant over time. Dilutive securities, however, make an increase in the number of shares likely. A dilutive increase in the shares outstanding in the future will reduce current shareholders' share of the revised stream of future earnings.[5]

When dilutive securities are outstanding, we define the revision in expected future earnings, arising from a time t earnings shock, that accrues to a current-period shareholder, as $\varepsilon_{1t,t+\tau} = \omega^\tau UE_t/E_t[N_{t+\tau}]$, where $E_t[N_{t+\tau}]$ is the dilution-adjusted number of shares expected to be outstanding in period $t + \tau$. A current shareholder's claim to the revision in the future earnings stream is less persistent when a firm has issued dilutive securities, since:

$$\varepsilon_{1t,t+\tau} = \frac{\omega^\tau UE_t}{E_t[N_{t+\tau}]} = \omega^\tau \varepsilon_{1t}\left(\frac{N_t}{N_t + E_t[\Delta N(t,t+\tau)]}\right) < \omega^\tau \varepsilon_{1t} \quad \text{from } (\tau = 1,\infty), \tag{5}$$

where $E_t[\Delta N(t,t + \tau)]$ is the expected number of dilutive shares issued between t and $t + \tau$.

Taking dilution into account, we can rewrite the ERC from equation (4) as:

$$\begin{aligned} ERC &= \left(1 + \sum_{\tau=1}^{\infty} \frac{\omega^\tau}{\rho^\tau}\left(\frac{N_t}{N_t + E_t[\Delta N(t,t+\tau)]}\right)\right) \leq \left(1 + \sum_{\tau=1}^{\infty} \frac{\omega^\tau}{\rho^\tau}\left(\frac{N_t}{N_t}\right)\right) \\ &= \left(1 + \frac{\omega}{\rho - \omega}\right). \end{aligned} \tag{6}$$

Equation (6) posits that the ERC for firm-years with dilutive securities will be smaller than the ERC for firm-years without dilutive securities, and that the difference between them

[4] This is Ohlson's (1995) equation (6) from page 670, adjusting for risk as suggested on page 680.
[5] We are interested in dilutive shares. New shares sold at the market price, with proceeds invested in at least zero net present value projects, are not dilutive.

will depend on the timing and magnitude of future dilutions, $E_t[\Delta N(t,t+\tau)]$. Accordingly, we test the hypothesis that the ERC is a decreasing function of expected dilution.

A simple example serves to illustrate. Assume a constant discount rate of 10 percent and a random walk process for earnings (i.e., $\omega = 1$). Further, assume that the current change in total earnings is \$100 and that there are 100 shares outstanding. If the firm has no dilutive securities, then each shareholder will expect to get \$1 in perpetuity, and the change in share price will be \$10. Adding this period's \$1 unexpected earnings yields an ERC of 11, as predicted.[6]

Now consider the case when a firm has dilutive securities outstanding, and current shareholders expect the firm to issue 25 dilutive shares five years from today. In this case, shareholders no longer have \$1 in perpetuity; instead, they have a \$1, four-year annuity and an eighty-cent perpetuity beginning in year five. The present value of this stream is:

$$PV = \$1 \times \left[\frac{1}{0.10}\left(1 - \frac{1}{(1.10)^4}\right)\right] + \left(\frac{\$0.80}{0.10}\right)\left(\frac{1}{(1.10)^4}\right) = \$8.63. \tag{7}$$

Adding 1 to this yields an ERC of 9.63, which is less than the predicted ERC of 11. The dilutive securities attenuate the effect of good news on common stock value, because some of the added value from the good news accrues to the holders of dilutive securities. Figure 1 illustrates how the effect of dilutive securities on the theoretical ERC varies with both the amount of potential dilution and the timing of dilution when $\omega = 1$, $\rho = 1.10$, and only one future dilutive event occurs at time t.

We cannot measure expected dilution directly, but we can develop a proxy for expected dilution based on the actual dilutive effect of exercise or conversion. The actual dilutive effect of exercise or conversion is given by:

$$\%Dilution = \left(\frac{P_t - X}{P_t}\right) \times \left(\frac{M}{N_t + M}\right), \tag{8}$$

where X is the strike price, P_t is the market price of one common share immediately preceding the time of exercise, M is the number of new shares issued, and N_t is the total shares outstanding prior to exercise.[7] We assume that holders of dilutive securities will not exercise if $P_t < X$ so %Dilution ≥ 0. %Dilution $\times (N_t + M)$ is the number of shares issued in excess of those that the firm could purchase with the proceeds from exercise.

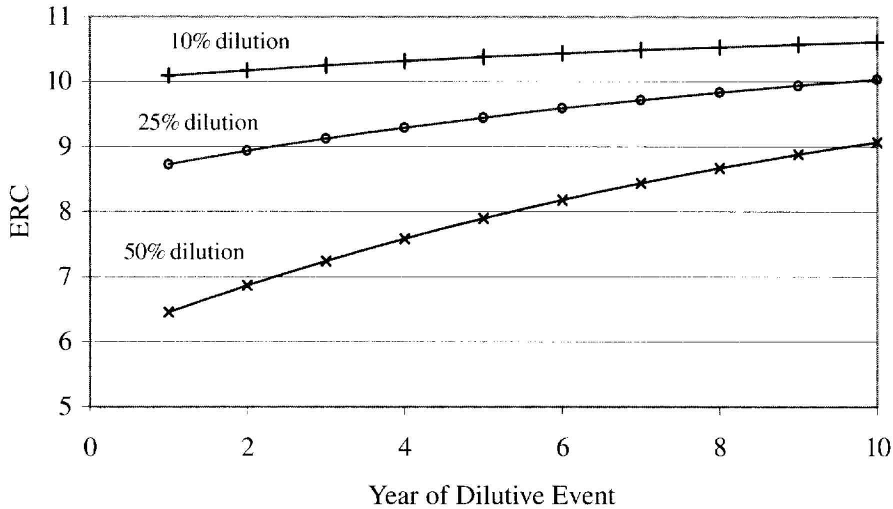
Since realized dilution is increasing in the number of dilutive securities when $P_t > X$, we argue that expected dilution is increasing in the number of dilutive securities (M). Expected dilution should also increase in the difference between the market value of the shares immediately preceding exercise and the option's strike price $(P_t - X)$. We therefore argue that expected dilution increases with good news about firm value. The following interrelated hypotheses consider how the existence and conversion probability of equity-like securities affect the theoretical ERC:

[6] Dividend policy will affect expected dilution because only cash retained in the firm can be diluted. Higher dividend payout should lead to lower dilutive impact of reserved shares. We leave detailed consideration of this issue to future research.

[7] Convertible securities have embedded warrants with implicit strike prices equal to the market value of the convertible security divided by the number of common shares for which it is exchanged (see Ingersoll 1977, 310; Cox and Rubinstein 1985, 400).

FIGURE 1

Effect of a 10 percent, 25 percent, or 50 percent one-time dilutive event in year t on the theoretical earnings response coefficient (ERC).[a] The theoretical ERC when there is no expected dilution is 11.



[a] We assume earnings follow a random walk and a constant 10 percent discount rate. The theoretical ERC when there is only one potentially dilutive event can be written as:

$$\text{ERC} = 1 + \frac{\omega}{\rho - \omega}\left[1 - \left(\frac{\omega}{\rho}\right)^{(t-1)}\left(\frac{M}{N + M}\,\frac{(P_t - X)}{X}\right)\right],$$

where:

ω = persistence of an earnings shock;
ρ = 1 plus the discount rate;
t = time when dilution occurs;
M = number new shares issued;
N = number of shares outstanding;
P_t = current share price; and
X = strike price of options.

H1a: The earnings response coefficient is inversely related to the number of dilutive securities outstanding.

H1b: Good news about firm value exacerbates the negative effect of reserved shares on ERCs.

III. SAMPLE AND RESEARCH DESIGN

Sample

The sample includes all firms on Compustat for the years 1970–1995 with nonmissing values for total shares outstanding, reserved shares, income, and book value for which the requisite return data were available from the Center for Research in Security Prices (CRSP) files. We begin with 116,990 firm-years that have Compustat data (total shares outstanding, reserved shares, income, and book value). Requirements for market value, current returns, and three years of prior returns to calculate the variance of returns reduce the sample to 63,656 firm-years.

Key Independent Variables

We measure the relative use of dilutive shares, which we need to test H1a, using the variable PERCENT = Shares Reserved/(Shares Outstanding + Shares Reserved). We define shares reserved as the total number of common shares that the firm would issue if investors converted all convertible securities into common shares, and exercised all options issuable under option plans (Compustat data item #40).[8] Compustat's number of shares reserved for conversion of debt and preferred shares gives an accurate count of the maximum number of new common shares that may be issued in connection with convertible securities. However, Compustat's number of shares reserved under option plans overstates the number of shares reserved for options currently outstanding, because Compustat includes shares reserved for both issued and unissued options.

We confirm the construct validity of the Compustat data by collecting the actual number of shares reserved for outstanding options in 1993, 1994, and 1995 from the 10-Ks of 350 of our sample firms.[9] We recalculate PERCENT using the data from the 10-Ks and correlate this figure with the PERCENT variable calculated from Compustat data. The Pearson correlation coefficients between the two measures exceed 0.75 each year. Thus, the machine-readable Compustat data provide a reasonable proxy for the number of dilutive shares outstanding.[10]

Table 1 shows the distribution of PERCENT averaged both over decades and over two-digit SIC codes. Firms' use of dilutive securities increased markedly from the 1970s to the 1990s. On average, the percentage of shares reserved for conversion increased from 8.58 percent in the 1970s to 12.28 percent in the 1990s.[11] Thus, the potential for dilution, although recently more severe, should have been important to the market's valuation of securities throughout the period examined.

Our theory predicts that dilutive securities become more costly to current shareholders when there is good news about firm value. Hypothesis 1b focuses on the relation between expected dilution and good news. We test this hypothesis using both price-based and earnings-based definitions of news. The change in the firm's common stock price affects both the likelihood and the magnitude of expected dilution. Increasing share prices increase the likelihood of conversion, and equation (8) shows that as the market price moves above the exercise price, the percent (i.e., magnitude) of dilution increases. Thus, good news increases

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[8] The requirement to disclose the common shares reserved for convertible securities, options, or warrants arose with the Securities Acts of 1933 and 1934. Firms made disclosures through several documents until Regulation S-K in 1977 standardized these disclosures and made the 10-K the primary reporting mechanism. Regulation S-K, subpart 229.200, Securities of the Registrant, lists the requirements for continuous disclosure.

[9] The SEC mandated disclosure of shares reserved for outstanding options on firm 10-K's for filings on or after January 1, 1994.

[10] The dilutive share data obtained from both Compustat and from firm 10-K's overstate dilution for a variety of reasons. With respect to options, some issued options are canceled, forfeited, or not exercised. The company receives proceeds equal to the exercise price for all exercised options. With respect to convertible securities, the company receives effective proceeds resulting from the debt cancellation.

[11] Outstanding options increased from approximately 70 percent of total reserved shares in 1984 to 80 percent of total reserved shares in 1995.

TABLE 1
Common Shares Reserved for Conversion in Various Industries 1970–1995[a]

Industry Name	*Two-digit SIC Code*	*1970–79*	*1980–89*	*1990–95*
Agriculture, Forestry, and Fishing	01–09	7.78%	6.89%	9.93%
Mining and Construction	10–19	8.34%	9.33%	10.86%
Manufacturing	20–29	8.07%	8.16%	11.00%
	30–39	9.47%	10.61%	13.30%
Transportation, Communication, Utilities	40–49	5.43%	9.72%	12.16%
Wholesale and Retail Trade	50–59	8.15%	9.14%	12.41%
Finance, Insurance, and Real Estate	60–69	8.80%	9.08%	9.41%
Services	70–79	10.49%	11.81%	15.19%
	80–89	12.04%	12.37%	16.57%
Public Administration	90–99	12.61%	11.80%	12.15%
Total Sample		8.58%	9.79%	12.28%

[a] For each firm-year, we calculate $PERCENT_{it}$ = Shares $Reserved_{it}$/(Shares $Outstanding_{it}$ + Shares $Reserved_{it}$). Each cell shows the average $PERCENT_{it}$ in each group of SIC codes for the time period shown.

the likelihood and magnitude of expected dilution, which in turn attenuates the effect of unexpected earnings on share price (i.e., ERCs). In other words, we expect investors to mark-to-market outstanding options.

Ideally, we want to measure how far "in the money" the options are expected to be at the exercise date. Firms experiencing increasing share prices are more likely to have options that are in the money. Since our research design relates current unexpected returns to current unexpected earnings, we cannot use current price change as an independent variable. Current measures of dilution from either treasury stock or option-pricing calculations are also problematic because each has a component related to current returns.[12] We take advantage of the path-dependent nature of conversion probabilities and use past price changes to separate firms based on the expected dilutive effect of reserved shares. Using all sample firm-years, we examine the distribution of annual price changes in the year prior to measuring earnings changes and returns. We then identify those firms whose stock price increases were in the top quartile of this distribution, and assign to the dummy variable HIRET the value of 1 for these firms and 0 otherwise. Similarly, we create a LOWRET dummy variable for firms in the bottom quartile of the price change distribution. These return-based proxies capture news from $t-2$ to $t-1$. Our second proxy for news is based on earnings. We assign to the dummy variable POSCHANGE a value of 1 if the change in earnings from period $t-1$ to period t is positive, and 0 otherwise.[13]

[12] This is true for option-based adjustments as well as treasury stock-based adjustments because option values are increasing in market price. See, for example, Stoll and Whaley (1993, 220).

[13] The variable POSCHANGE also serves as a control because we cannot assume a symmetric market response to good and bad earnings news (Basu 1997). We are grateful to an anonymous referee for suggesting this specification.

Control Variables

Collins and Kothari (1989) demonstrate that the ERC will vary with firm size, depending on the window over which the returns are measured. They also demonstrate that the ERC is positively related to growth opportunities and inversely related to risk. Firms that issue dilutive securities are smaller and riskier, and have greater growth opportunities than other firms (Mikkelson 1981; Brennan and Schwartz 1988; Smith and Watts 1992; Stein 1992). Our tests control for these factors to demonstrate that dilutive securities play a significant incremental role in moderating the earnings/return relation.

We use the log of the opening market value of equity as our size proxy (LMVALUE).[14] The variance of the firm's monthly returns calculated over the prior three years (RETVAR) is our risk proxy. We employ two proxies for growth opportunities. First, the ratio of a firm's market value to its book value measured at the beginning of the year (MKTTOBK) is a widely used growth proxy that incorporates the market value of intangible assets beyond that reported in the firm's accounting numbers. Second, Mikkelson (1981) and Smith and Watts (1992) document a positive association between the use of dilutive securities and growth. If firms that issue dilutive securities have higher growth prospects, all else being equal, they will have higher ERCs. This effect could dominate any direct negative effect of the dilutive shares. We control for differences between firms that use and do not use dilutive securities with an indicator variable (DS_USER). This variable equals 1 in firm-years with dilutive securities and 0 otherwise.

Freeman and Tse (1992) show that marginal price responses to unexpected earnings are a declining function of the magnitude of the earnings surprise. Risky firms with growth opportunities may well have large earnings surprises. Since firms with these characteristics are likely to use dilutive securities (Brennan and Schwartz 1988; Stein 1992), we control for the absolute value of the earnings surprise (|DIFFINC|)to ensure that the coefficient on the percent of reserved shares is not simply an artifact of the nonlinearity documented by Freeman and Tse (1992).

Hayn (1995) demonstrates that the market's response to earnings changes is diminished when earnings are negative (i.e., when the firm experiences a loss). She attributes the attenuation to shareholders' option to liquidate the firm if the liquidation value exceeds the present value of the firm's future cash flows. Firms that report losses may be more likely to issue contingent claims in lieu of either cash compensation (executive stock options) or straight debt (convertible debt). To ensure that the reserved-shares variable is not simply picking up the effect of negative reported earnings, we follow Hayn (1995) and control for reported losses by defining POSEARN as equal to 1 if annual total income is greater than 0 in both the current and the prior fiscal year, and 0 otherwise.

Model Specification

We model the ERC as a function of the percentage of shares reserved for conversion, size, risk, growth, the magnitude of the earnings surprise, and the presence of positive earnings, in order to test H1a. We use the following regression model to test H1a, which predicts $\beta_1 < 0$:

[14] Results are robust to use of the log of opening total assets as the size proxy.

$$\begin{aligned}
UR12_{it} &= \alpha + \beta\ DIFFINC_{it} + e_{it};\\
\beta &= \beta_0 + \beta_1 PERCENT_{it} + \beta_2 LMVALUE_{it} + \beta_3 RETVAR_{it}\\
&\quad + \beta_4 MKTTOBK_{it} + \beta_5 DS_USER_{it} + \beta_6 |DIFFINC_{it}|\\
&\quad + \beta_7 POSEARN_{it}. \qquad \text{(Model 1)}
\end{aligned}$$

$UR12_{it}$ is the size-adjusted return for firm i, cumulated over a 12-month period ending with the last day of fiscal year t. We use the first difference in annual total income before extraordinary items as our proxy for unexpected abnormal earnings, and scale by the opening market value of equity to create $DIFFINC_{it}$.[15] All other variables are as described above.

To test H1b, we augment Model 1 so that the influence of PERCENT is allowed to vary with both price-based and earnings-based proxies for conversion likelihood. The model containing the price-based proxies follows:

$$\begin{aligned}
UR12_{it} &= \alpha + \beta\ DIFFINC_{it} + e_{it};\\
\alpha &= \alpha_0 + \alpha_2 HIRET_{it} + \alpha_3 LOWRET_{it};\\
\beta &= \beta_0 + \beta_1 PERCENT_{it} + \beta_2 LMVALUE_{it} + \beta_3 RETVAR_{it}\\
&\quad + \beta_4 MKTTOBK_{it} + \beta_5 DS_USER_{it} + \beta_6 |DIFFINC_{it}|\\
&\quad + \beta_7 POSEARN_{it} + \beta_8 HIRET_{it} + \beta_9 LOWRET_{it};\\
\beta_1 &= \gamma_0 + \gamma_1 HIRET_{it} + \gamma_2 LOWRET_{it}. \qquad \text{(Model 2)}
\end{aligned}$$

Our particular interest is in the three-way interactions of DIFFINC and PERCENT with HIRET and LOWRET.[16] We expect to see a negative coefficient on the interaction of DIFFINC, PERCENT, and HIRET (i.e., $\gamma_1 < 0$) and a positive coefficient on the interaction of DIFFINC, PERCENT, and LOWRET (i.e., $\gamma_2 > 0$). A negative γ_1 will indicate that as the likelihood and dilutive effect of conversion (as proxied by the stock price run-up over the prior year) increase, the current stockholders' share of the revised expectation of future earnings becomes smaller. A positive γ_2 indicates that as the likelihood and dilutive effect of conversion decrease, the current stockholders' share of the revised expectation of future earnings becomes larger.[17]

Alternately, we use our earnings-based definition of news in Model 2, and replace the variables HIRET and LOWRET with the variable POSCHANGE. We predict a negative coefficient on the interaction of DIFFINC, PERCENT, and POSCHANGE. Finally, we combine both the price-based and the earnings-based news proxies in the same regression model. In this specification, the stock price run-up captures news about the firm up to period $t-1$, while the contemporaneous earnings change captures news about the firm from period $t-1$ to period t.

Table 2 presents descriptive statistics for our sample firms. Panel A presents distributional characteristics, and Panel B presents both Pearson and Spearman correlations for the variables used in the analysis. Comparison of the mean and median values in Panel A

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[15] We discuss the limitations of this proxy in Section IV.

[16] Jegadeesh and Titman (1993) and Soffer and Walther (2000) document persistence in stock returns measured over intervals of less than one year. We therefore employ HIRET and LOWRET as main effects to control for the correlation between past and current returns.

[17] Using stock price changes measured over the four years preceding the current fiscal year does not change our results.

TABLE 2
Descriptive Statistics for 63,656 Firm-Year Observations from 1970–1995

Panel A: Distributional Characteristics of Independent Variables

	Mean	*Median*	*Standard Deviation*
DIFFINC	0.0107	0.0106	0.1266
PERCENT	12.76%	7.92%	14.88%
MVALUE	561.222	55.389	2698.581
RETVAR	0.6287	0.4732	0.5236
MKTTOBK	1.3951	1.0856	0.9460
DS_USER	0.8764	1.0000	0.3291
|DIFFINC|	0.0739	0.0340	0.1033
POSEARN	0.7596	1.0000	0.4273

DIFFINC = the first difference in annual total income scaled by MVALUE;
PERCENT = a firm's shares reserved for conversion as a percentage of total shares outstanding plus shares reserved for conversion;
MVALUE = the market value of a firm's equity measured at the beginning of the fiscal year ($MM);
RETVAR = the monthly variance of a firm's raw returns measured over the three-year period prior to the year total income is measured;
MKTTOBK = the ratio of a firm's market value to its book value measured at the beginning of the fiscal year;
DS_USER = an indicator variable taking on a value of 1 if the firm has shares reserved for conversion or the exercise of options or warrants, and 0 otherwise; and
POSEARN = an indicator variable taking on a value of 1 if annual total income is greater than zero in both the current and the prior fiscal year, and 0 otherwise.

(*Continued on next page*)

TABLE 2 (Continued)

Panel B: Correlation coefficients between variables used in the analysis of the effect of dilutive shares on the earnings/return relation. P-values are in parentheses. Pearson correlations are above the diagonal, and Spearman correlations are below the diagonal.

	UR12	*DIFFINC*	*PERCENT*	*LMVALUE*	*RETVAR*	*MKTTOBK*	*DS_USER*	*$\lvert$DIFFINC$\rvert$*	*POSEARN*
UR12		0.297 (0.0001)	−0.034 (0.0001)	0.041 (0.0001)	−0.090 (0.0001)	0.172 (0.0001)	−0.010 (0.011)	−0.024 (0.0001)	0.207 (0.0001)
DIFFINC	0.398 (0.0001)		0.006 (0.148)	−0.055 (0.0001)	0.032 (0.0001)	0.005 (0.180)	−0.002 (0.699)	0.135 (0.0001)	0.065 (0.0001)
PERCENT	−0.408 (0.0001)	0.013 (0.002)		−0.108 (0.0001)	0.218 (0.0001)	0.005 (0.171)	0.322 (0.0001)	0.144 (0.0001)	−0.197 (0.0001)
LMVALUE	0.080 (0.0001)	−0.062 (0.0001)	−0.063 (0.0001)		−0.432 (0.0001)	0.208 (0.0001)	0.084 (0.0001)	−0.329 (0.0001)	0.263 (0.0001)
RETVAR	−0.130 (0.0001)	0.028 (0.0001)	0.274 (0.0001)	−0.486 (0.0001)		0.140 (0.0001)	0.121 (0.0001)	0.213 (0.0001)	−0.301 (0.0001)
MKTTOBK	0.225 (0.0001)	0.040 (0.0001)	0.039 (0.0001)	0.371 (0.0001)	0.026 (0.0001)		0.043 (0.0001)	−0.164 (0.0001)	−0.038 (0.0001)
DS_USER	−0.022 (0.0001)	0.008 (0.034)	0.570 (0.0001)	0.080 (0.0001)	0.163 (0.0001)	0.100 (0.0001)		0.032 (0.0001)	−0.067 (0.0001)
$\lvert$DIFFINC$\rvert$	0.021 (0.0001)	0.154 (0.0001)	0.146 (0.0001)	−0.389 (0.0001)	0.280 (0.0001)	−0.308 (0.0001)	0.039 (0.0001)		−0.530 (0.0001)
POSEARN	0.234 (0.0001)	0.095 (0.0001)	−0.190 (0.0001)	−0.266 (0.0001)	−0.303 (0.0001)	0.060 (0.0001)	−0.067 (0.0001)	−0.488 (0.0001)	

UR12 = the 12-month raw return less the 12-month return on the corresponding size portfolio; and LMVALUE = the log market value of a firm's equity measured at the beginning of the fiscal year.
Other variables are as defined in Panel A.

reveals that many of the variables are skewed, so we winsorize all variables at 1 percent and 99 percent. (Subsequently reported sensitivity analysis uses rank regressions to ensure that our results are not attributable to extreme values.) Not surprisingly, Panel B reveals a strong positive correlation between PERCENT and DS_USER. The correlations in Panel B also show that, consistent with our earlier discussion, firms that use dilutive securities more extensively are likely to be riskier, with more variable earnings.

IV. RESULTS AND DISCUSSION

This section presents the results of the empirical tests of H1a and H1b. Table 3 presents our test of H1a, which predicts that the ERC is a decreasing function of the number of dilutive securities. We provide additional analysis that demonstrates the robustness of the results to different specifications. Table 4 presents our test of H1b, which predicts that good news about firm value increases the negative effect of reserved shares on ERCs. All reported test statistics use White (1980) heteroskedasticity-consistent standard errors, and reported significance levels are for two-tailed tests.

The Effect of Dilutive Securities on the ERC: H1a

We begin with a simple model that regresses $UR12_{it}$ on only DIFFINC and DIFFINC $\times$ PERCENT. The estimated coefficient on the interaction of PERCENT with DIFFINC is negative (-0.883) and significant (t-statistic = -8.56), supporting H1a. We then estimate Model 1 to control for other factors that affect the earnings/return relation. Table 3 presents the results, pooled both over all years and by decade. Both the pooled and the per-decade results support H1a. Using all sample years, the estimated coefficient on the interaction of PERCENT with DIFFINC is -0.611 (t-statistic = -4.29).[18] The typical firm (i.e., a firm with dilutive securities, positive earnings, and average values of lagged market value, return variance, market-to-book ratio, and absolute value of the earnings shock) would have an estimated ERC of 1.89 if it had reserved shares equal to 2 percent of its current shares outstanding. This same firm with reserved shares equal to 20 percent of its current shares outstanding would have an estimated ERC of 1.80. Moving from a low percentage of reserved shares to a high percentage of reserved shares reduces the ERC by 4.76 percent.

The remaining columns in Table 3 estimate the relation over the 1970s, 1980s, and 1990s. The negative impact of reserved shares on the ERC (the interaction of PERCENT and DIFFINC) is significant in each decade. The coefficient estimates (t-statistics) for the 1970s, 1980s, and 1990s are -0.774 (-2.98), -0.532 (-2.47), and -0.690 (-2.49), respectively.

The strength of the results is comparable across the decades despite the fact that the level and precision of disclosures pertaining to executive stock options increased after the political debate concerning executive compensation commencing in 1991 (Bloomenthal and Holme Roberts & Owen 1998). The SEC adopted new, more rigorous disclosure requirements in 1992 and 1993 (e.g., Securities Act Releases 6962 and 7032). The FASB (1995) also began deliberations on accounting for stock options, culminating in SFAS No. 123,

[18] Collinearity diagnostics (Jobson 1991; Belsley et al. 1980) indicate that only one eigenvector has a condition index (13.8) in excess of 10. Further, the variance inflation factor (VIF) on DIFFINC $\times$ PERCENT is the second smallest of the interactions. If we remove the interaction with the highest VIF (DIFFINC $\times$ DS_USER), the sign and significance of DIFFINC $\times$ PERCENT remains unchanged. These diagnostics indicate that multicollinearity is unlikely to affect our inferences. In addition, the Table 3 results are robust to the following specifications: (1) inclusion of main effects for all of the interactive variables, (2) employing both the prior earnings levels and the current earnings change (Easton and Harris 1991; Ali and Zarowin 1992; Biddle et al. 1995), and (3) mean-adjusting all the independent variables prior to calculating interactions (Aiken and West 1991).

TABLE 3
Regression Analysis of the Effect of Dilutive Shares on the Earnings/Return Relation

$$UR12_{it} = \alpha + \beta\ DIFFINC_{it} + e_{it}$$
$$\beta = \beta_0 + \beta_1 PERCENT_{it} + \beta_2 LMVALUE_{it} + \beta_3 RETVAR_{it}$$
$$+ \beta_4 MKTTOBK_{it} + \beta_5 DS\_USER_{it} + \beta_6 |DIFFINC_{it}| + \beta_7 POSEARN_{it}$$

		All Years	*1970–79*	*1980–89*	*1990–95*
Intercept		−0.042	−0.062	−0.026	−0.046
		(−28.85)	(−23.15)	(−11.41)	(−15.07)
DIFFINC	(+)	0.879	0.463	0.895	0.907
		(12.19)	(2.01)	(8.24)	(6.24)
DIFFINC × PERCENT	(−)	−0.611	−0.774	−0.532	−0.690
		(−4.29)	(−2.98)	(−2.47)	(−2.49)
DIFFINC × LMVALUE	(+)	0.070	0.088	0.065	0.054
		(7.90)	(4.23)	(5.01)	(3.17)
DIFFINC × RETVAR	(−)	−0.055	−0.124	−0.035	−0.030
		(−1.88)	(−2.34)	(−0.78)	(−0.55)
DIFFINC × MKTTOBK	(+)	0.271	0.839	0.266	0.169
		(7.76)	(3.25)	(4.52)	(3.67)
DIFFINC × DS_USER	(+)	0.277	0.168	0.249	0.494
		(5.49)	(1.93)	(3.28)	(4.61)
DIFFINC × |DIFFINC|	(−)	−0.238	−2.076	−2.427	−2.571
		(−25.75)	(−17.29)	(−17.29)	(−12.94)
DIFFINC × POSEARN	(+)	0.127	1.018	1.172	1.461
		(29.91)	(18.28)	(18.35)	(12.35)
Adj. R^2		15.57%	19.46%	14.86%	14.05%
n		63,656	20,386	26,207	17,063

The dependent variable is UR12 (the 12-month raw return less the 12-month return on the corresponding size portfolio).
t-statistics calculated with heteroskedasticity-consistent variance estimators as in White (1980) in parentheses.

DIFFINC = the first difference in annual total income scaled by MVALUE, the opening market value of equity;
PERCENT = a firm's shares reserved for conversion as a percentage of total shares outstanding plus shares reserved for conversion;
LMVALUE = the log market value of a firm's equity measured at the beginning of the fiscal year;
RETVAR = the variance of a firm's raw returns measured over the three-year period prior to the measurement of UR12;
MKTTOBK = the ratio of a firm's market value to its book value measured at the beginning of the fiscal year;
DS_USER = an indicator variable taking on a value of 1 if the firm has shares reserved for conversion or the exercise of options or warrants, and 0 otherwise; and
POSEARN = an indicator variable taking on a value of 1 if annual total income is greater than 0 in both the current and the prior fiscal year, and 0 otherwise.

Accounting for Stock-Based Compensation," in October 1995. Table 3 suggests that even during earlier periods, when the accounting disclosures were less extensive and detailed than they are now, the market impounded expectations of future dilution into stock price.

The results in Table 3 are based on changes in total earnings, consistent with equation (6), which demonstrates how dilutive securities attenuate the ERC. Since accounting standards attempt to incorporate earnings dilution in the EPS calculation, we examine whether the GAAP adjustments for dilution are sufficient to remove the negative effect of our dilution proxy, PERCENT, on the ERC. We obtain comparable results when we replicate H1a replacing DIFFINC, the scaled year-to-year change in total income before extraordinary items, with (1) the scaled year-to-year change in primary EPS before extraordinary items (Compustat data item #58), and (2) the scaled year-to-year change in fully diluted EPS before extraordinary items (Compustat data item #57). The coefficient (t-statistic) on the interaction of PERCENT with the change in primary EPS is -0.609 (-4.06), while the coefficient (t-statistic) on the interaction of PERCENT with the change in fully diluted EPS is -0.631 (-3.61).[19] Thus, the negative sign on the interaction of PERCENT with each of the EPS measures, each of which contains a GAAP-based measure of dilution, suggests that the GAAP dilution adjustments are less than those made by the market.

It is likely that GAAP dilution adjustments are inadequate because of the manner in which the treasury stock method incorporates outstanding options. The treasury stock method treats all options as if today were the exercise date, and does not attempt to assess dilution that may arise from future price movements. For options at or out of the money, the treasury stock method reports no dilution. Since executive stock options are generally issued at the money, GAAP ignores the expected dilution attributable to many outstanding options. Core et al. (2000) provide evidence that the treasury stock method understates expected dilution. However, an alternative explanation for the negative sign on the interaction even when we use the diluted EPS numbers is that our tests fail to control for some omitted correlated factor.

Robustness Checks

We run several additional tests (untabulated) to rule out the possibility that our results are driven by a correlated omitted factor. These tests include using an "overly diluted" EPS measure, estimating regressions using only issuers of dilutive securities, and estimating industry and firm-specific regressions. In addition, we employ rank regressions to control for the skewness in our data.

We rerun the Table 3 regressions using an overly diluted EPS as our measure of DIFFINC, where we compute EPS as earnings available to common shareholders divided by shares outstanding plus total shares reserved for conversion. Core et al. (2000) suggest that this overly diluted EPS measure is a reliable and conservative estimate of EPS. Since this earnings measure overstates dilution, the implication of current unexpected earnings for future earnings should *increase* with the number of shares reserved. This is opposite from the prediction for the original definition of DIFFINC, so that for this specification the interaction of DIFFINC and PERCENT should be positive rather than negative. Conversely, if PERCENT is simply capturing a correlated omitted factor, the coefficient on the interaction of PERCENT and overly diluted EPS should remain negative. Consistent with the contention that PERCENT proxies for expected dilution and that the treasury stock method

[19] The similarity of these results is consistent with the high correlation between scaled changes in total earnings and scaled changes in primary EPS (fully diluted EPS) of 0.98 (0.87).

understates dilution, the estimated coefficient on the interaction of PERCENT and the change in overly diluted EPS is positive (0.490, t-statistic = 3.81).

As additional corroboration that PERCENT is not capturing some correlated omitted factor specific to firms or industries that issue dilutive securities, we estimate regressions on the subset of firms that issue dilutive securities, industry regressions, and firm-specific regressions. We first re-estimate the Table 3 regressions on only those observations for which DS_USER = 1. Consistent with our prior results, the interaction of PERCENT with DIFFINC is significantly negative in this specification, with a t-statistic (significance level) of −4.10 (0.0001).[20]

We next estimate industry- and firm-specific regressions to provide additional assurance that our results are not driven by differences between issuers and nonissuers of dilutive securities. These tests also help address concerns that our proxy for unexpected earnings—the first difference in annual earnings—does not allow for cross-sectional variation in the persistence of earnings shocks (ω) or the cost of capital (ρ), nor does it consider the nonearnings-related information that may enter into earnings expectations (ν_t). We expect the persistence of shocks and the cost of capital to be relatively constant both within industries and for individual firms. The industry regressions also control for any industry-wide, nonearnings-related information. If nonearnings-related information is random across firms, then it is not a concern for our tests.

We estimate the industry regressions separately for the 100 three-digit SIC codes that have at least 200 firm-years of data between 1970 and 1995. To control for variation between firms within an industry, we use all of the control variables reported in the Table 3 regressions. We then aggregate the 100 industry-specific t-statistics on the interaction between DIFFINC and PERCENT to form a Z-statistic.[21] Results of the industry regressions corroborate the results presented in Table 3, showing that they are not attributable to characteristics that differ across industries. The mean (median) coefficient on the interaction of DIFFINC and PERCENT is −1.089 (−1.236). The Z-statistic on the mean coefficient is −6.30 (p-value < 0.001). Sixty-four percent of the industry regressions produce a negative coefficient on the interaction of DIFFINC and PERCENT.

We estimate 319 firm-specific regressions for firms that meet the following criteria: We select all firms with at least 20 years of data between 1970 and 1995 and separate them into quintiles based on the time-series variability of PERCENT. We select firms in the top two quintiles to ensure sufficient variability in the PERCENT variable. Since each firm is its own control, we estimate a standard regression of returns on earnings changes, including the interaction on PERCENT and DIFFINC. We include |DIFFINC| as a control variable since the magnitude of a firm's earnings shocks can vary over time.

The mean (median) coefficient on the interaction of DIFFINC and PERCENT is −2.634 (−1.256) with a p-value of 0.04 (0.06). The range from the 1st to 3rd quartiles of the firm-specific regression coefficients is from −12.04 to 6.79 and 55 percent of the firm-specific regressions produce a negative coefficient on the interaction of DIFFINC and PERCENT.

[20] This specification also rules out the possibility that a spurious relation induced by including both DS_USER and PERCENT in the same regression model drives the main Table 3 results.

[21] We calculate the Z-statistic by aggregating the t-statistics from the industry regressions as follows: $Z_i = (1/\sqrt{N_i}) \sum_{j=1}^{N_i} t_j/\sqrt{k_j/(k_j-2)}$, where t_j = t-statistic for firm j, k_j = degrees of freedom in the regression for firm j, and N_i = number of firms in sample i. See, for example, Christie (1990), Barth (1994), and Dechow et al. (1994).

TABLE 4

Regression Analysis of the Effect of Dilutive Shares on the Earnings/Return Relation after Controlling for the Likelihood and Magnitude of Expected Dilution

$$UR12_{it} = \alpha + \beta\ DIFFINC_{it} + e_{it}$$

$$\alpha = \alpha_0 + \alpha_2 HIRET_{it} + \alpha_3 LOWRET_{it}$$

$$\beta = \beta_0 + \beta_1 PERCENT_{it} + \beta_2 LMVALUE_{it} + \beta_3 RETVAR_{it} + \beta_4 MKTTOBK_{it} + \beta_5 DS\_USER_{it} + \beta_6 |DIFFINC_{it}| + \beta_7 POSEARN_{it} + \beta_8 HIRET_{it} + \beta_9 LOWRET_{it} + \beta_{10} POSCHANGE_{it}$$

$$\beta_1 = \begin{cases} \gamma_0 + \gamma_1 HIRET_{it} + \gamma_2 LOWRET_{it} & MODEL\ 2(a) \\ \gamma_0 + \gamma_3 POSCHANGE_{it} & MODEL\ 2(b) \\ \gamma_0 + \gamma_1 HIRET_{it} + \gamma_2 LOWRET_{it} + \gamma_3 POSCHANGE_{it} & MODEL\ 2(c) \end{cases}$$

		MODEL 1	*MODEL 2(a)*	*MODEL 2(b)*	*MODEL 2(c)*
Intercept		−0.042	−0.039	−0.033	−0.033
		(−28.85)	(−20.45)	(−19.55)	(−16.15)
DIFFINC	(+)	0.879	0.913	0.866	0.894
		(12.19)	(12.20)	(11.74)	(11.74)
DIFFINC × PERCENT	(−)	−0.611	−0.562	−0.045	−0.041
		(−4.29)	(−2.70)	(−0.24)	(−0.17)
DIFFINC × LMVALUE	(+)	0.070	0.061	0.066	0.058
		(7.90)	(6.87)	(7.51)	(6.55)
DIFFINC × RETVAR	(−)	−0.055	−0.085	−0.049	−0.079
		(−1.88)	(−2.84)	(−1.69)	(−2.66)
DIFFINC × MKTTOBK	(+)	0.271	0.276	0.277	0.280
		(7.76)	(7.90)	(7.80)	(7.89)
DIFFINC × DS_USER	(+)	0.277	0.292	0.280	0.296
		(5.49)	(5.80)	(5.56)	(5.86)
DIFFINC × |DIFFINC|	(−)	−0.238	−2.299	−2.183	−2.147
		(−25.75)	(−24.92)	(−22.42)	(−22.10)
DIFFINC × POSEARN	(+)	0.127	1.073	1.173	1.111
		(29.91)	(28.28)	(29.51)	(27.78)
HIRET	(+)		0.023		0.023
			(6.34)		(6.40)
LOWRET	(−)		−0.035		−0.031
			(−9.93)		(−8.73)
DIFFINC × HIRET			0.189		0.184
			(3.14)		(3.05)
DIFFINC × LOWRET			−0.153		−0.158
			(−3.18)		(−3.28)

(*Continued on next page*)

TABLE 4 (Continued)

		MODEL 1	*MODEL 2(a)*	*MODEL 2(b)*	*MODEL 2(c)*
DIFFINC × PERCENT × HIRET	(−)		−0.609		−0.604
			(−1.70)		(−1.68)
DIFFINC × PERCENT × LOWRET	(+)		0.266		0.293
			(0.95)		(1.04)
DIFFINC × POSCHANGE				−0.131	−0.085
				(−2.64)	(−1.72)
DIFFINC × PERCENT × POSCHANGE	(−)			−0.994	−0.938
				(−3.93)	(−3.74)
Adj. R^2		15.57%	15.95%	15.71%	16.04%
n		63,656	63,656	63,656	63,656

The dependent variable is UR12 (the 12-month raw return less the 12-month return on the corresponding size portfolio).
t-statistics calculated with heteroskedasticity-consistent variance estimators as in White (1980) in parentheses.

DIFFINC = the first difference in annual total income scaled by MVALUE, the opening market value of equity;
PERCENT = a firm's shares reserved for conversion as a percentage of total shares outstanding plus shares reserved for conversion;
LMVALUE = the log market value of a firm's equity measured at the beginning of the fiscal year;
RETVAR = the variance of a firm's raw returns measured over the three-year period prior to the measurement of UR12;
MKTTOBK = the ratio of a firm's market value to its book value measured at the beginning of the fiscal year;
DS_USER = an indicator variable taking on a value of 1 if the firm has shares reserved for conversion or the exercise of options or warrants, and 0 otherwise;
POSEARN = an indicator variable taking on a value of 1 if annual total income is greater than 0 in both the current and the prior fiscal year, and 0 otherwise;
HIRET = a value of 1 if the firm's stock price change in year t − 1 is in the top quartile of year t − 1 price changes and 0 otherwise;
LOWRET = a value of 1 if the firm's stock price change in year t − 1 is in the bottom quartile of year t − 1 price changes and 0 otherwise; and
POSCHANGE = an indicator variable taking on a value of 1 if DIFFINC is positive, and 0 otherwise.

The Z-statistic on the mean coefficient is −3.49, with a p-value of 0.001.[22] These results are somewhat weaker than the industry regressions. A potential explanation is that the firm-specific regressions use 7,298 firm-years or 11.5 percent of the total sample, whereas the industry regressions use 48,679 firm-years or 76.5 percent of the sample.

As a final specification check, we perform rank regressions following the methodology of Cheng et al. (1992) because our data are skewed. We rank every continuous variable and scale the ranks to lie between 0 and 1. Results are robust to this specification. The interaction of PERCENT with DIFFINC in the rank regression produces a coefficient estimate (t-statistic) of −0.25 (−3.51).

[22] The firm-specific analysis has the following additional benefits: (1) results are not subject to problems of contemporaneous correlation of errors, and (2) multicollinearity is not an issue because of the simple model employed.

These additional tests suggest that the results from Table 3 are not attributable to PERCENT's capturing a correlated omitted factor. A regression of abnormal returns on an overly diluted measure of EPS produces a positive interaction with PERCENT, while the interaction between DIFFINC and PERCENT continues to be negative and significant in regressions that include only firms with outstanding dilutive securities, regressions by industry, and firm-specific regressions. Additionally, results are robust to the rank regression specification.

Is the Dilutive Effect Stronger in the Presence of Good News: H1b

Table 4 presents four regression models. Model 1 presents our test of H1a (Column 1 from Table 3), and Models 2a, 2b, and 2c present alternative tests of H1b. We use all firm-years because Table 3 does not reveal temporal shifts in the relation between earnings changes and returns.

Models 2a, 2b, and 2c extend Model 1 to include price- and earnings-based proxies for the likelihood and dilutive impact of conversion. Model 2a incorporates the price-based proxies HIRET and LOWRET. The HIRET (LOWRET) firms are those for whom stock price changes over the prior year were in the top (bottom) quartile of all sample firms. We focus on the interaction of HIRET (LOWRET) with income changes (DIFFINC) and the percentage of shares reserved for conversion/exercise (PERCENT), since our theory predicts that the dilutive effect of reserved shares will be larger (smaller) for firms with rising (falling) prices.

The coefficient estimate for the three-way interaction of DIFFINC, PERCENT, and HIRET is negative (-0.609) and marginally significant with a p-value of 0.10 (t-statistic $= -1.70$). This provides weak evidence that, among firms with dilutive securities, the market expects current investors' share of future earnings to decline as the likelihood of conversion/exercise increases. This negative relation reflects the higher expected dilution for firms with price increases, and is consistent with investors' implicitly marking outstanding options and convertible securities to market. The three-way interaction of DIFFINC, PERCENT, and LOWRET is insignificant (t-statistic $= 0.95$). The insignificantly positive coefficient suggests that increases and decreases in firm value do not have symmetrical effects.[23] The two-way interaction of DIFFINC and PERCENT remains negative (-0.562) and significant (t-statistic $= -2.70$) in Model 2a despite the presence of *HIRET*. These results imply that the market perceives dilutive securities as costly in general, while anticipating more dilution for firms that have had larger stock price run-ups.

Model 2b uses the earnings-based conversion proxy POSCHANGE. We are interested in the interaction of DIFFINC, PERCENT, and POSCHANGE. The coefficient on this interaction is -0.994 (t-statistic $= -3.93$). This result suggests that the market's reaction to good earnings news is attenuated by the likelihood that some of the value added by this news accrues to the option holders. The coefficient estimate on the interaction between DIFFINC and PERCENT captures the anticipated dilution of negative and zero earnings changes. This interaction is insignificant, consistent with current shareholders expecting to share positive earnings changes, but not expecting to share negative earnings changes, with the holders of dilutive securities.

Model 2c incorporates both the price-based and the earnings-based proxies for the spread between strike and market prices in the same regression model. The price-based proxies incorporate news about the firm up to time $t - 1$, and the earnings-based proxy

[23] This is perhaps related to the fact that option value increases in the value of the underlying faster than it decreases in the value of the underlying (i.e., options are convex). This presents an interesting question for future research.

picks up news about the firm from time t −1 to time t. The coefficients on both proxies for positive news, the interaction of DIFFINC, PERCENT, and HIRET, and the interaction of DIFFINC, PERCENT, and POSCHANGE, maintain their statistically significant negative signs, consistent with the hypothesis that equity investors view their share of unexpected earnings as being less permanent as the likelihood of sharing it with other stakeholders' increases.

V. CONCLUSIONS

Firms are increasingly using stock options and convertible securities. The FASB has expressed concern that investors do not fully understand the value implications of these securities. Adapting Ohlson's (1995) model, we demonstrate analytically that rational investors should place less value on unexpected earnings when they expect dilutive securities to lead to future earnings dilution.

We use the percentage of shares held in reserve for conversion of dilutive securities as a proxy for expected dilution, and show empirically that the ERC is a decreasing function of expected dilution. This relation holds after controlling for firm size, risk, growth opportunities, the magnitude of the unexpected earnings, and the sign of current earnings. Further, we show that the effect of reserved shares is greater for firms when the likelihood and dilutive effects of conversion are greater (i.e., firms that have recently experienced "good news").

A limitation of our study is that we employ proxies rather than exact measures for both unexpected abnormal earnings and expected dilution. Our proxy for unexpected abnormal earnings, the first difference in annual earnings, does not allow for cross-sectional variation in persistence, nonearnings information, or the cost of capital. If the error in our proxy is correlated with reserved shares, then our results may be affected by correlated omitted factors. We address this issue, in part, through our control variables and industry- and firm-specific regressions. We base our proxy for expected dilution on the total number of shares reserved for conversion or exercise. Because we cannot quantify expected dilution precisely, we do not prescribe how accountants should measure the earnings of firms that issue dilutive securities.

Our results contribute to the ERC literature by identifying expected earnings dilution as an additional firm characteristic that provides investors with information about their share of future firm cash flows. More broadly, these results illustrate a cost of issuing dilutive securities. The benefits of issuing convertibles include lower interest for convertible debt and higher prices for convertible preferred, whereas the issuance of options provides compensation that both conserves cash and aligns the interests of management and employees with those of shareholders. However, an important cost associated with these securities is that the market will discount favorable earnings performance when future dilution of these earnings is likely.

Recent changes in disclosures pertaining to dilutive securities do not fully reflect the effect of these securities on firm value. The fact that reserved shares further attenuate the ERC even after we employ diluted EPS in our regression analysis implies that SFAS No. 128 understates expected dilution. Additionally, while SFAS No. 123 requires firms to disclose the market value of options on the grant date, it does not require firms to disclose subsequent changes in that value. Our results are consistent with investors' attempting to mark dilutive securities to market, and hence, we would expect investors to use more timely, marked-to-market option values if they were available.

A useful avenue for future research would be to explore how best to communicate to investors information concerning dilutive securities. Alternatives include simple disclosure of the marked-to-market values, EPS adjustments similar to those in Core et al. (2000), and inclusion of the changes in the marked-to-market values in reported income.

APPENDIX

Another way to think about the dilutive effects of option-like securities is to approach the problem with option-pricing tools. If we consider an all-equity firm with only common equity outstanding, then the value of the common equity is equal to firm value:

$$E = V \tag{I}$$

If we consider an all-equity firm that has issued executive stock options (ESOs), then the value of the common equity is the value of the firm less the value of the ESOs:[24]

$$E = V - nC(V, X, T, r, \sigma) \tag{II}$$

where:

- n = number of ESOs;
- C = value of an ESO;
- E = value of common equity;
- V = value of the firm;
- X = strike price;
- T = time to expiration;
- r = risk-free rate of interest; and
- σ = standard deviation of the value of assets.

The earnings response coefficient is the change in the value of common equity for a change in earnings represented by e:

$$ERC = \frac{\partial E}{\partial e}. \tag{III}$$

When there are no ESOs:

$$ERC = \frac{\partial E}{\partial e} = \frac{\partial V}{\partial e}. \tag{IV}$$

When there are ESOs (recall that $E = V - nC(V, X, T, r, \sigma)$):

$$ERC = \frac{\partial E}{\partial e} = \frac{\partial V}{\partial e} - \frac{\partial V}{\partial e} n \frac{\partial C}{\partial V} = \frac{\partial V}{\partial e}\left(1 - n\frac{\partial C}{\partial V}\right). \tag{V}$$

Holding all else constant, the ERC is decreasing in the number of shares under option (n) since $0 < (\partial C/\partial V) \leq 1$. This is H1a. Equation (V) also shows that, for a given level of

[24] The analysis carries through for levered firms as well. The assumptions underlying the analysis are those of the Black and Scholes (1973) model, as well as that (1) the warrants have finite life, and (2) the proceeds from exercise are invested in zero net present value projects.

outstanding ESOs, the ERC is a function of the "delta" ($\partial C/\partial V$) of the options. Hypothesis 1b comes from examining how $(1 - n(\partial C/\partial V))$ changes as the value of equity changes:

$$\frac{\partial\left(1 - n\frac{\partial C}{dV}\right)}{\partial E} = -n\frac{\partial^2 C}{\partial V^2} < 0. \quad \text{(VI)}$$

The dilutive effect of ESOs is greater for firms that have had price increases since $(\partial^2 C/\partial V^2) > 0$.[25] This is H1b.

An additional prediction is that the effect of dilutive securities is asymmetric for good and bad news. Holding the impact of earnings on firm value ($\partial V/\partial e$) constant, $\partial^2 C/\partial V^2 > 0$ leads to larger ERCs for bad news and smaller ERCs for good news. This predicts an asymmetric response to positive and negative news.

[25] See, for example, Stoll and Whaley (1993, 225).

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